Historic, archived document
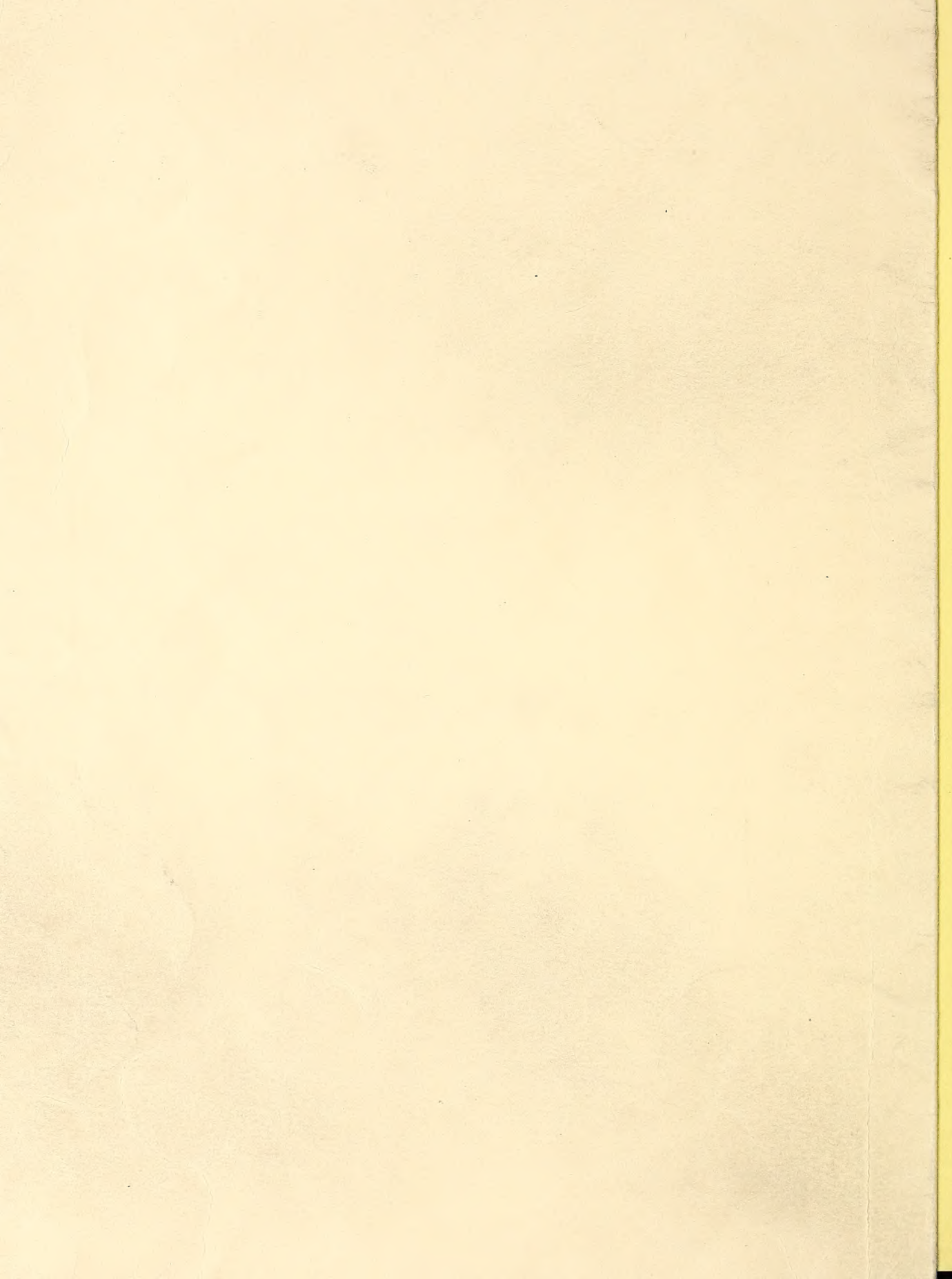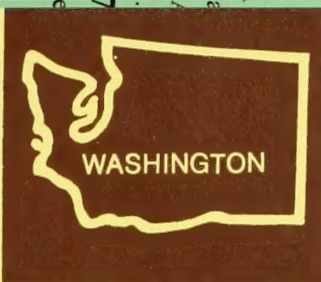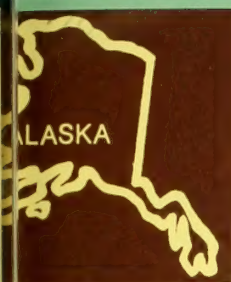
Do not assume content reflects current
scientific knowledge, policies, or practices.

VOLUME TABLES AND EQUATIONS FOR OLD-GROWTH WESTERN

REDCEDAR AND ALASKA-CEDAR IN SOUTHEAST ALASKA

by

Wilbur A. Farr, *Mensurationist*

and

Vernon J. LaBau, *Mensurationist*

ABSTRACT

Separate cubic-foot volume tables are given for western redcedar (*Thuja plicata* Donn) and Alaska-cedar (*Chamaecyparis nootkatensis* (D. Don) Spach). Board-foot tables are given for both species combined.

Keywords: *Tree volume tables, tree volume measurement, western redcedar, Alaska-cedar.*

Over the past several years double entry volume tables and equations have been developed for most of the major tree species in Alaska (Haack 1963a and 1963b, Gregory and Haack 1964, Embry and Haack 1965, Farr 1967, Bones 1968, Dippold and Farr 1971). Equations for these tables were derived using weighted linear regression of the form first used by Haack (1963a) and later more fully described by Gregory and Haack (1964).

·Suitable volume tables were lacking for the two cedars of southeast Alaska, western redcedar (*Thuja plicata* Donn) and Alaska-cedar (*Chamaecyparis nootkatensis* (D. Don) Spach). The value of these
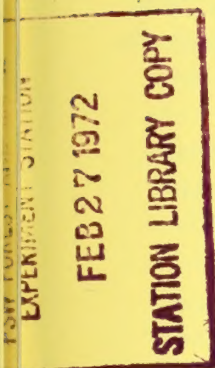
species has increased substantially in recent years to where they presently command an average round-log value higher than any other Alaskan tree species. The volume tables presented here were developed to more accurately describe these valuable cedars. All existing tree measurement data were screened and compiled, and the resulting volume equations and tables are presented here.

METHODS

Basic tree measurements came from data collected some years ago by Kimmey (1956), data collected recently by Laurent,[1] and data gathered over the years in timber management research.

Western redcedar ranged in diameter from 6 to 66 inches with heights up to 158 feet. Alaska-cedar was smaller with diameters from 5 to 28 inches and heights up to 107 feet.

Points of stem measurement were not consistent among all data, so graphic or computer interpolation techniques were used to obtain necessary upper stem diameters.

Smalian's formula was used to compute cubic volume for 16. 3-foot[2] logs between the top of the butt log and the 4-inch top inside bark. For butt logs, diameter inside bark at the 1-foot stump, breast height, and at the 9.15-foot point were also used for cubic volume calculations so that volume of the butt logs could be more accurately determined. International 1/4-inch and Scribner scales were used to compute board-foot volumes for 16. 3-foot logs to the 40-percent[3] and 6-inch tops (inside bark).

Weighted linear regression was used to develop volume prediction equations. The weighted combined variable equation used was of the

---

[1] Thomas H. Laurent. Cull study for coastal Alaska commercial tree species, 1967. Study plan on file at the Inst. N. Forest., Juneau, Alaska.

[2] Includes 0. 3-foot trim allowance.

[3] A top equaling 40 percent of d. b. h. but not less than 6.0 inches inside bark.

form used previously to develop volume equations for Alaska's tree species. That is:

$$\frac{V}{D^2H} = \frac{b_0}{D^2H} + \frac{b_1}{DH} + \frac{b_2}{H} + \frac{b_3}{D^2} + b_4 + \frac{b_5}{D^4H}$$

or unweighted:

$$V = b_0 + b_1D + b_2D^2 + b_3H + b_4D^2H + \frac{b_5}{D^2}$$

Separate equations were developed for each species-volume combination. Tests using analysis of covariance indicated that separate cubic-foot volume equations were needed for western redcedar and Alaska-cedar, but that all board-foot volume data for the two species could be pooled. Separate cubic-foot volume tables were then prepared for each species (tables 1-6). For board-foot volume tables, data for both species were pooled (tables 7-14). The weighted equations used and their precision are given in footnote 1 of each volume table.

LITERATURE CITED

Bones, James T.
    1968. Volume tables and equations for old-growth western hemlock and Sitka spruce in southeast Alaska. USDA Forest Serv. Res. Note PNW-91, 11 p. Pac. Northwest Forest & Range Exp. Sta., Portland, Oreg.

Dippold, Ronald M., and Wilbur A. Farr.
    1971. Volume tables and equations for white spruce, balsam poplar, and paper birch of the Kuskokwim River Valley, Alaska. USDA Forest Serv. Res. Note PNW-147, 8 p. illus. Pac. Northwest Forest & Range Exp. Sta., Portland, Oreg.

Embry, Robert S., and Paul M. Haack.
    1965. Volume tables and equations for young-growth western hemlock and Sitka spruce in southeast Alaska. USDA Forest Serv. Res. Note NOR-12, 21 p. N. Forest Exp. Sta., Juneau, Alaska.

Farr, Wilbur A.
    1967.   Board-foot tree volume tables and equations for white spruce in interior Alaska. USDA Forest Serv. Res. Note PNW-59, 4 p. Pac. Northwest Forest & Range Exp. Sta. , Portland, Oreg.

Gregory, Robert A. , and Paul M. Haack.
    1964.   Equations and tables for estimating cubic-foot volume of interior Alaska tree species. USDA Forest Serv. Res. Note NOR-6, 21 p. N. Forest Exp. Sta. , Juneau, Alaska.

Haack, Paul M.
    1963a. Volume tables for hemlock and Sitka spruce on the Chugach National Forest, Alaska. USDA Forest Serv. Res. Note NOR-4, 4 p. N. Forest Exp. Sta. , Juneau, Alaska.

————————
    1963b. Volume tables for trees of interior Alaska. USDA Forest Serv. Res. Note NOR-5, 11 p. N. Forest Exp. Sta. , Juneau, Alaska.

Kimmey, James W.
    1956.   Cull factors for Sitka spruce, western hemlock, and western redcedar in southeast Alaska. USDA Forest Serv. Alaska Forest Res. Center Sta. Pap. 6, 31 p. , illus. Juneau, Alaska.

Table 1.--Cubic-foot volumes (1-foot stump to 4-inch top d.i.b.) given d.b.h. and total height, Smalian's formula, for western redcedar, southeast Alaska[1]

D.b.h. (D)[2]	Total height in feet (H)[3]															Basis: trees measured[4]
	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	
Inches																Number
6	2.3	2.7	3.2	3.6	4.1											10
8	4.9	5.7	6.6	7.4	8.2											7
10	8.1	9.4	10.6	11.9	13.2	14.4	15.7									5
12	11.9	13.7	15.5	17.3	19.2	21.0	22.8	24.6								3
14		18.8	21.2	23.7	26.2	28.7	31.2	33.7								5
16			27.8	31.1	34.3	37.5	40.8	44.0	47.3							1
18			35.3	39.4	43.5	47.6	51.7	55.8	59.9	64.0						10
20			43.6	48.6	53.7	58.8	63.8	68.9	74.0	79.0						12
22			52.7	58.9	65.0	71.1	77.3	83.4	89.5	95.7						7
24			62.8	70.1	77.4	84.7	92.0	99.3	107	114						9
26			73.7	82.3	90.8	99.4	108	117	125	134	142					9
28				95.4	105	115	125	135	145	155	165	175				6
30				110	121	132	144	155	167	178	189	201	212			10
32				125	138	151	164	177	190	202	215	228	241			13
34					155	170	185	199	214	229	243	258	272	287		9
36					174	191	207	223	240	256	273	289	306	322	338	14
38					194	212	231	249	267	286	304	322	340	359	377	9
40					215	235	256	276	296	316	337	357	377	397	418	6
42					237	259	282	304	326	349	371	393	416	438	461	10
44					260	285	309	334	358	383	407	432	456	481	505	5
46							338	365	392	418	445	472	499	526	552	5
48							368	397	426	456	485	514	543	572	602	6
50							399	431	463	494	526	558	589	621	653	--
52							432	466	500	535	569	603	637	672	706	7
54							466	503	540	577	614	650	687	724	761	2
56								541	580	620	660	700	739	779	819	--
58								580	623	665	708	750	793	836	878	--
60								621	666	712	757	803	849	894	940	--
62								663	711	760	809	858	906	955	1004	1
64								706	758	810	862	914	966	1017	1069	--
66								751	806	861	917	972	1027	1082	1137	1
68								797	856	914	973	1032	1090	1149	1207	--
70								845	907	969	1031	1093	1155	1217	1279	--

1/ Based on weighted regression: $V = 0.04578D^2 + 0.001266D^2H - \frac{27.17}{D^2}$. Standard error of estimate = 13.56 cubic feet or 7.09 percent of the mean volume.

2/ 10-inch class includes trees 9.0 to 10.9 inches in diameter.

3/ 80-foot class includes trees 75.1 to 85.0 feet in height.

4/ Number of trees; range of data for 182 trees enclosed by solid lines.

5

Table 2.—Cubic-foot volumes (1-foot stump to a 4-inch top d.i.b.) given d.b.h. and total height, Smalian's formula for Alaska-cedar, southeast Alaska [1]

D.b.h. (D)[2]	Total height in feet (H)[3]										Basis: trees measured[4]
	30	40	50	60	70	80	90	100	110	120	
Inches											Number
6	2.2	3.2	4.2	5.2							6
8	4.2	5.7	7.2	8.8	10.3	11.9					17
10	6.4	8.6	10.8	13.1	15.3	17.5					17
12	9.0	12.1	15.1	18.2	21.3	24.3					10
14			20.2	24.2	28.3	32.3	36.4	40.5			5
16			25.9	31.1	36.3	41.6	46.8	52.0			3
18			32.4	39.0	45.5	52.0	58.5	65.0			5
20			39.7	47.7	55.6	63.6	71.6	79.5			3
22					66.9	76.5	86.0	95.6	105		2
24					79.2	90.5	102	113	125		3
26					92.6	106	119	132	146		--
28						122	138	153	168	184	1
30						140	158	175	193	210	--

[1] Based on weighted regression: $V = 0.0316H + 0.001911D^2H - \dfrac{28.78}{D^2}$. Standard error of estimate = 1.91 cubic feet or 7.68 percent of the mean volume.

[2] 10-inch class includes trees 9.0 to 10.9 inches in diameter.

[3] 80-foot class includes trees 75.1 to 85.0 feet in height.

[4] Number of trees; range of data for 72 trees enclosed by solid lines.

Table 3.--Cubic-foot volumes (1-foot stump to 4-inch top d.i.b.) given d.b.h. and number of logs to a 6-inch top, Smalian's formula, for western redcedar, southeast Alaska [1]

D.b.h. (D) [2]	Merchantable height in 16-foot logs (H) [3]										Basis: trees measured [4]
	1	2	3	4	5	6	7	8	9	10	
Inches											Number
12	5.0	10.0	15.1	20.1							3
14	6.8	13.7	20.5	27.3	34.2						5
16	8.9	17.9	26.8	35.7	44.6	53.6					1
18	11.3	22.6	33.9	45.2	56.5	67.8					10
20	13.9	27.9	41.8	55.8	69.7	83.7					12
22		33.8	50.6	67.5	84.4	101					7
24		40.2	60.3	80.3	100	121					9
26		47.1	70.7	94.3	118	141					9
28			82.0	109	137	164	191				6
30			94.1	126	157	188	220	251			10
32			107	143	179	214	250	286			13
34			121	161	202	242	282	322	363		9
36			136	181	226	271	316	362	407		14
38			151	201	252	302	352	403	453		9
40			167	223	279	335	391	446	502		6
42			185	246	308	369	431	492	554		10
44			203	270	338	405	473	540	608		5
46				295	369	443	516	590	664		5
48				321	402	482	562	643	723		6
50				349	436	523	610	697	785		--
52					471	566	660	754	849		7
54					508	610	712	813	915		2
56					547	656	765	875	984		--
58					586	704	821	938	1056		--
60					628	753	879	1004	1130		--
62						804	938	1072	1206	1340	1
64						857	1000	1143	1285	1428	--
66						911	1063	1215	1367	1519	1
68						967	1129	1290	1451	1612	--
70						1025	1196	1367	1538	1709	--

[1] Based on weighted regression: $V = 0.034867D^2H$. Standard error of estimate = 37.38 cubic feet or 17.23 percent of the mean volume.

[2] 20-inch class includes trees 19.0 to 20.9 inches in diameter.

[3] Computed in 16.3-foot logs between a 1-foot stump and a 6-inch top inside bark.

[4] Number of trees; range of data for 160 trees enclosed by solid lines.

Table 4.—*Cubic-foot volumes (1-foot stump to 4-inch top d.i.b.) given d.b.h. and number of logs to a 6-inch top, Smalian's formula, for Alaska-cedar, southeast Alaska*[1]

D.b.h. (D)[2]	Merchantable height in 16-foot logs (H)[3]							Basis: trees measured[4]
	1	2	3	4	5	6	7	
Inches								*Number*
12	8.0	15.9	23.9	31.9				10
14	9.7	19.3	29.0	38.6	48.3			5
16	11.6	23.2	34.8	46.4	58.0			3
18	13.8	27.6	41.4	55.3	69.1			5
20	16.3	32.6	48.8	65.1	81.4			3
22		38.0	57.0	76.0	95.0	114		2
24		44.0	66.0	88.0	110	132		3
26			75.7	101	126	151	177	--
28			86.2	115	144	172	201	1
30			97.5	130	163	195	228	--

[1] Based on weighted regression: $V = 3.2982H + 0.032452D^2H$. Standard error of estimate = 4.43 cubic feet or 9.64 percent of the mean volume.

[2] 20-inch class includes trees 19.0 to 20.9 inches in diameter.

[3] Computed in 16.3-foot logs between a 1-foot stump and a 6-inch top inside bark.

[4] Number of trees; range of data for 32 trees enclosed by solid lines.

8

Table 5.--*Cubic-foot volumes (1-foot stump to 4-inch top, d.i.b.) given d.b.h. and number of logs to a 40-percent top, Smalian's formula, for western redcedar, southeast Alaska*[1]

D.b.h. (D)[2]	Merchantable height in 16-foot logs (H)[3]							Basis: trees measured[4]
	1	2	3	4	5	6'	7	
Inches								Number
12	12.0	17.8	23.7	29.5				3
14	15.1	23.1	31.0	39.0	47.0			5
16	18.6	29.0	39.4	49.8	60.2			1
18	22.3	35.5	48.7	61.9	75.0	88.2		10
20	26.4	42.7	59.0	75.2	91.5	108		12
22	30.9	50.6	70.2	89.9	110	129		7
24	35.6	59.1	82.5	106	129	153		9
26	40.7	68.2	95.7	123	151	178		9
28	46.1	78.0	110	142	174	206		6
30	51.9	88.5	125	162	198	235	271	10
32	57.9	99.6	141	183	225	266	308	13
34	64.3	111	158	205	252	299	346	9
36	71.0	124	176	229	282	335	387	14
38	78.1	137	196	254	313	372	430	9
40	85.4	150	216	281	346	411	476	6
42	93.1	165	237	308	380	452	524	10
44		180	259	337	416	495	574	5
46		196	282	368	454	540	626	5
48		212	306	399	493	587	680	6
50		229	330	432	534	635	737	--
52			356	466	576	686	796	7
54			383	502	620	739	858	2
56			411	539	666	794	921	--
58			440	577	714	850	987	--
60			470	616	763	909	1055	--
62			501	657	813	970	1126	1
64			532	699	865	1032	1199	--
66			565	742	919	1096	1274	1
68			599	787	975	1163	1351	--
70			633	833	1032	1231	1431	--

[1] Based on weighted regression: $V = 0.5088D + 0.040668D^2H$. Standard error of estimate = 16.40 cubic feet or 7.56 percent of the mean volume.

[2] 20-inch class includes trees 19.0 to 20.9 inches in diameter.

[3] Computed in 16.3-foot logs between a 1-foot stump and a top equaling 40 percent of d.b.h., but never less than 6.0 inches inside bark.

[4] Number of trees; range of data for 160 trees enclosed by solid lines.

Table 6.--*Cubic-foot volumes (1-foot stump to 4-inch top, d.i.b.) given d.b.h. and number of logs to a 40-percent top, Smalian's formula, for Alaska-cedar, southeast Alaska*[1]

D.b.h. (D)[2]	Merchantable height in 16-foot logs (H)[3]					Basis: trees measured[4]
	1	2	3	4	5	
Inches						*Number*
12	7.8	15.6	23.4	31.2		10
14	9.9	19.8	29.7	39.6	49.5	5
16	12.3	24.6	37.0	49.3	61.6	3
18	15.1	30.1	45.2	60.2	75.3	5
20		36.2	54.3	72.4	90.6	3
22		43.0	64.5	86.0	107	2
24		50.4	75.6	101	126	3
26		58.4	87.7	117	146	--
28		67.1	101	134	168	1
30		76.5	115	153	191	--

[1] Based on weighted regression: $V = 2.0180H + 0.040236D^2 H$. Standard error of estimate = 3.81 cubic feet or 8.31 percent of the mean volume.

[2] 20-inch class includes trees 19.0 to 20.9 inches in diameter.

[3] Computed in 16.3-foot logs between 1-foot stump and a top equaling 40 percent of d.b.h., but not less than 6.0 inches inside bark.

[4] Number of trees; range of data for 32 trees enclosed by solid lines.

Table 7.—Board-foot volumes (1-foot stump to 6-inch top d.i.b.) given d.b.h. and total height, International 1/4-inch scale, for western redcedar and Alaska-cedar, southeast Alaska [1]

D.b.h. (D) [2] Inches	Total height in feet (H) [3]															Basis: trees measured [4]	
	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	Red-cedar	Alaska-cedar
																Number	
12	13	40	68	95	123	150	178	205								3	10
14	18	51	84	117	150	183	216	249								5	5
16			104	144	183	222	262	301	341							1	3
18			129	175	222	269	315	362	409	455						10	5
20			157	212	267	322	377	431	486	541						12	3
22			191	254	318	382	445	509	573	637						7	2
24			228	301	375	448	522	595	669	742						9	3
26			269	354	438	522	606	690	774	859						9	—
28				411	507	602	698	794	889	985	1081					6	1
30				473	581	689	797	905	1013	1121	1229	1338				10	—
32				541	662	783	905	1026	1147	1268	1389	1511	1632			13	—
34					749	884	1019	1155	1290	1425	1561	1696	1831	1966		9	—
36					842	992	1142	1292	1442	1593	1743	1893	2043	2193	2343	14	—
38					940	1106	1272	1438	1604	1770	1936	2102	2268	2434	2600	9	—
40					1045	1227	1410	1593	1775	1958	2140	2323	2505	2688	2870	6	—
42					1156	1356	1556	1756	1956	2156	2356	2556	2756	2956	3156	10	—
44					1272	1490	1709	1927	2145	2364	2582	2800	3019	3237	3455	5	—
46							1870	2107	2344	2582	2819	3057	3294	3532	3769	5	—
48							2038	2296	2553	2810	3068	3325	3583	3840	4098	6	—
50							2214	2493	2771	3049	3328	3606	3884	4163	4441	—	—
52							2398	2698	2998	3298	3598	3898	4199	4499	4799	7	—
54							2590	2912	3235	3557	3880	4203	4525	4848	5171	2	—
56								3135	3481	3827	4173	4519	4865	5211	5557	—	—
58								3366	3736	4107	4477	4847	5218	5588	5958	—	—
60								3605	4001	4396	4792	5187	5583	5978	6374	—	—
62								3854	4275	4697	5118	5539	5961	6382	6804	1	—
64								4110	4559	5007	5455	5903	6352	6800	7248	—	—
66								4375	4851	5327	5803	6279	6755	7231	7707	1	—
68								4649	5154	5658	6163	6667	7172	7676	8181	—	—
70								4931	5465	5999	6533	7067	7601	8135	8669	—	—

1/ Based on weighted regression: $V = -5.8214D + 1.2189H + 0.010647D^2H$. Standard error of estimate = 128.83 board feet or 11.04 percent of the mean volume.

2/ 20-inch class includes tree 19.0 to 20.9 inches in diameter.

3/ 80-foot class includes trees 75.1 to 85.0 feet in height.

4/ Number of trees; range of data for 160 redcedar and 32 Alaska-cedar enclosed by solid lines.

Table 8.--Board-foot volumes (1-foot stump to 6-inch top d.i.b.) given d.b.h. and total height, Scribner scale, for western redcedar and Alaska-cedar, southeastern Alaska[1]

D.b.h. (D)[2] Inches	Total height in feet (H)[3]															Basis: trees measured[4] Number	
	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	Red-cedar	Alaska-cedar
12	40	54	67	81	94	108	121	135								3	10
14	55	73	92	110	128	147	165	183								5	5
16			120	144	168	191	215	239	263							1	3
18			151	182	212	242	273	303	333	364						10	5
20			187	224	262	299	337	374	411	449						12	3
22			226	272	317	362	407	453	498	543						7	2
24			269	323	377	431	485	539	592	646						9	3
26			316	379	442	506	569	632	695	758						9	--
28				440	513	586	660	733	806	880	953	1026				6	1
30				505	589	673	757	841	926	1010	1094	1178	1262			10	--
32				574	670	766	862	957	1053	1149	1245	1340	1436			13	--
34					757	865	973	1081	1189	1297	1405	1513	1621	1729		9	--
36					848	969	1091	1212	1333	1454	1575	1696	1818	1939	2060	14	--
38					945	1080	1215	1350	1485	1620	1755	1890	2025	2160	2295	9	--
40					1047	1197	1346	1496	1646	1795	1945	2094	2244	2394	2543	6	--
42					1155	1319	1484	1649	1814	1979	2144	2309	2474	2639	2804	10	--
44					1267	1448	1629	1810	1991	2172	2353	2534	2715	2896	3077	5	--
46							1781	1978	2176	2374	2572	2770	2968	3165	3363	5	--
48							1939	2154	2370	2585	2800	3016	3231	3447	3662	6	--
50							2104	2337	2571	2805	3039	3272	3506	3740	3974	--	--
52							2275	2528	2781	3034	3287	3539	3792	4045	4298	7	--
54							2454	2726	2999	3272	3544	3817	4090	4362	4635	2	--
56								2932	3225	3519	3812	4105	4398	4691	4985	--	--
58								3145	3460	3774	4089	4403	4718	5032	5347	--	--
60								3366	3703	4039	4376	4712	5049	5385	5722	--	--
62								3594	3953	4313	4672	5032	5391	5750	6110	1	--
64								3830	4213	4596	4979	5362	5745	6127	6510	--	--
66								4073	4480	4887	5295	5702	6109	6516	6924	1	--
68								4323	4756	5188	5620	6053	6485	6917	7350	--	--
70								4581	5040	5498	5956	6414	6872	7330	7788	--	--

1/ Based on weighted regression: $V = 0.009350D^2H$. Standard error of estimate = 127.26 board feet or 11.63 percent of the mean volume.

2/ 20-inch class includes trees 19.0 to 20.9 inches in diameter.

3/ 80-foot class includes trees 75.1 to 85.0 feet in height.

4/ Number of trees; range of data for 160 redcedar and 32 Alaska-cedar enclosed by solid lines.

Table 9.—*Board-foot volumes (1-foot stump to 6-inch top d.i.b.) given d.b.h. and number of logs to a 6-inch top, International 1/4-inch scale, for western redcedar and Alaska-cedar, southeastern Alaska*[1]

D.b.h. (D)[2]	Merchantable height in 16-foot logs (H)[3]									Basis: trees measured[4]	
	1	2	3	4	5	6	7	8	9	Red-cedar	Alaska-cedar
Inches										*Number*	
12	41	82	122	163						3	10
14	50	101	151	201	252					5	5
16	61	123	184	245	307	368				1	3
18	74	147	221	295	369	442				10	5
20	88	175	263	351	438	526				12	3
22		206	309	412	515	618				7	2
24		240	360	479	599	719				9	3
26		276	415	553	691	829				9	—
28			474	632	790	948	1106			6	1
30			538	717	896	1075	1254	1433		10	—
32			606	807	1009	1211	1413	1615		13	—
34			678	904	1130	1356	1582	1808	2034	9	—
36			755	1007	1258	1510	1762	2013	2265	14	—
38			836	1115	1394	1672	1951	2230	2509	9	—
40			922	1229	1536	1844	2151	2458	2766	6	—
42			1012	1349	1687	2024	2361	2698	3036	10	—
44			1106	1475	1844	2213	2582	2950	3319	5	—
46				1607	2009	2410	2812	3214	3616	5	—
48				1745	2181	2617	3053	3489	3925	6	—
50				1888	2360	2832	3304	3776	4248	—	—
52					2547	3056	3565	4075	4584	7	—
54					2741	3289	3837	4385	4933	2	—
56					2942	3531	4119	4707	5296	—	—
58					3151	3781	4411	5041	5671	—	—
60					3367	4040	4713	5387	6060	—	—
62					3590	4308	5026	5744	6462	1	—
64					3821	4585	5349	6113	6877	—	—
66					4059	4870	5682	6494	7305	1	—
68					4304	5165	6025	6886	7747	—	—
70					4556	5468	6379	7290	8202	—	—

[1] Based on weighted regression: $V = 14.4466H + 0.183029D^2H$. Standard error of estimate = 129.05 board feet or 11.06 percent of the mean volume.

[2] 20-inch class includes trees 19.1 to 21.0 inches in diameter.

[3] Computed in 16.3-foot logs between a 1-foot stump and a 6-inch top inside bark.

[4] Number of trees; range of data for 160 redcedar and 32 Alaska-cedar enclosed by solid lines.

13

Table 10.—Board-foot volumes (1-foot stump to 6-inch top d.i.b.) given d.b.h. and number of logs to a 6-inch top, Scribner scale, for western redcedar and Alaska-cedar, southeastern Alaska [1]

D.b.h. (D) [2]	Merchantable height in 16-foot logs (H) [3]									Basis: trees measured [4]	
Inches	1	2	3	4	5	6	7	8	9	Red-cedar	Alaska-cedar
										Number	
12	33	66	99	132						3	10
14	42	84	126	169	211					5	5
16	53	105	158	211	264	316				1	3
18	65	129	194	259	323	388				10	5
20	78	156	234	312	390	468				12	3
22		186	279	371	464	557				7	2
24		218	327	436	545	655				9	3
26		253	380	507	634	760				9	--
28			437	583	729	874	1020			6	1
30			499	665	831	997	1163	1329		10	--
32			564	752	940	1128	1316	1504		13	--
34			634	845	1056	1268	1479	1690	1902	9	--
36			708	944	1180	1416	1652	1888	2124	14	--
38			786	1048	1310	1572	1834	2096	2358	9	--
40			869	1158	1448	1737	2027	2316	2606	6	--
42			955	1274	1592	1910	2229	2547	2866	10	--
44			1046	1395	1744	2092	2441	2790	3138	5	--
46				1522	1902	2283	2663	3043	3424	5	--
48				1654	2068	2481	2895	3308	3722	6	--
50				1792	2240	2689	3137	3585	4033	--	--
52					2420	2904	3388	3872	4356	7	--
54					2607	3128	3650	4171	4692	2	--
56					2801	3361	3921	4481	5041	--	--
58					3002	3602	4202	4803	5403	--	--
60					3210	3851	4493	5135	5777	--	--
62					3424	4109	4794	5479	6164	1	--
64					3646	4376	5105	5834	6564	--	--
66					3876	4651	5426	6201	6976	1	--
68					4112	4934	5756	6579	7401	--	--
70					4355	5226	6097	6968	7839	--	--

[1] Based on weighted regression: $V = 7.5946H + 0.176197D^2H$. Standard error of estimate = 122.66 board feet or 11.21 percent of the mean volume.

[2] 20-inch class includes trees 19.0 to 20.9 inches in diameter.

[3] Computed in 16.3-foot logs between a 1-foot stump and a 6-inch top inside bark.

[4] Number of trees; range of data for 160 redcedar and 32 Alaska-cedar enclosed by solid lines.

14

Table 11.--Board-foot volumes (1-foot stump to 40-percent top) given d.b.h. and total height, International 1/4-inch scale, for western redcedar and Alaska-cedar, southeastern Alaska [1]

D.b.h. (D) [2]	Total height in feet (H) [3]															Basis: trees measured [4]	
	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	Red-cedar	Alaska-cedar
Inches																Number	
12	43	58	72	86	101	115	130	144								3	10
14	59	78	98	118	137	157	176	196								5	5
16			128	154	179	205	230	256	281							1	3
18			162	194	227	259	291	324	356	389						10	5
20			200	240	280	320	360	400	440	480						12	3
22			242	290	339	387	435	484	532	581						7	2
24			288	345	403	461	518	576	633	691						9	3
26			338	405	473	541	608	676	743	811						9	--
28				470	549	627	705	784	862	940	1019	1097				6	1
30				540	630	720	810	900	990	1080	1169	1259	1349			10	--
32				614	716	819	921	1024	1126	1228	1331	1433	1535			13	--
34					809	924	1040	1155	1271	1387	1502	1618	1733			9	--
36					907	1036	1166	1295	1425	1555	1684	1814	1943	2073	2202	14	--
38					1010	1155	1299	1443	1588	1732	1876	2021	2165	2309	2454	9	--
40					1120	1279	1439	1599	1759	1919	2079	2239	2399	2559	2719	6	--
42					1234	1411	1587	1763	1940	2116	2292	2469	2645	2821	2997	10	--
44					1355	1548	1742	1935	2129	2322	2516	2709	2903	3096	3290	5	--
46							1904	2115	2327	2538	2750	2961	3173	3384	3596	5	--
48							2073	2303	2533	2764	2994	3224	3454	3685	3915	6	--
50							2249	2499	2749	2999	3249	3498	3748	3998	4248	--	--
52							2433	2703	2973	3243	3514	3784	4054	4325	4595	7	--
54							2623	2915	3206	3498	3789	4081	4372	4664	4955	2	--
56								3135	3448	3762	4075	4388	4702	5015	5329	--	--
58								3363	3699	4035	4371	4708	5044	5380	5716	--	--
60								3598	3958	4318	4678	5038	5398	5757	6117	--	--
62								3842	4227	4611	4995	5379	5763	6148	6532	1	--
64								4094	4504	4913	5322	5732	6141	6551	6960	--	--
66								4354	4790	5225	5660	6096	6531	6967	7402	1	--
68								4622	5084	5546	6009	6471	6933	7395	7857	--	--
70								4898	5388	5877	6367	6857	7347	7837	8326	--	--

1/ Based on weighted regression: $V = 0.009996D^2H$. Standard error of estimate = 141.82 board feet or 12.71 percent of the mean volume.

2/ 20-inch class includes trees 19.0 to 20.9 inches in diameter.

3/ 80-foot class includes trees 75.1 to 85.0 feet in height.

4/ Number of trees; range of data for 160 redcedar and 32 Alaska-cedar enclosed by solid lines.

Table 12.—*Board-foot volumes (1-foot stump to 40-percent top) given d.b.h. and total height, Scribner scale, for western redcedar and Alaska-cedar, southeastern Alaska*[1]

D.b.h. (D)[2] Inches	Total height in feet (H)[3]															Basis: trees measured[4]	
	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	Red-cedar	Alaska-cedar
																Number	
12	40	53	66	79	92	105	119	132								3	10
14	54	72	90	108	126	143	161	179								5	5
16			117	141	164	187	211	234								1	3
18			148	178	208	237	267	297	326	356						10	5
20			183	220	256	293	329	366	403	439						12	3
22			221	266	310	354	399	443	487	532						7	2
24			264	316	369	422	474	527	580	633						—	3
26			309	371	433	495	557	619	681	742	804					9	—
28				430	502	574	646	717	789	861	933	1004				6	1
30				494	577	659	741	824	906	988	1071	1153	1235			10	—
32				562	656	750	843	937	1031	1125	1218	1312	1406			13	—
34					741	846	952	1058	1164	1270	1375	1481	1587			9	—
36					830	949	1067	1186	1305	1423	1542	1660	1779	1898	2016	14	—
38					925	1057	1189	1322	1454	1586	1718	1850	1982	2114	2247	9	—
40					1025	1171	1318	1464	1611	1757	1904	2050	2196	2343	2489	6	—
42					1130	1291	1453	1614	1776	1937	2099	2260	2422	2583	2744	10	—
44					1240	1417	1595	1772	1949	2126	2303	2480	2658	2835	3012	5	—
46							1743	1937	2130	2324	2517	2711	2905	3098	3292	5	—
48							1898	2109	2319	2530	2741	2952	3163	3374	3585	6	—
50							2059	2288	2517	2746	2974	3203	3432	3661	3889	—	—
52							2227	2475	2722	2970	3217	3464	3712	3959	4207	7	—
54							2402	2669	2936	3202	3469	3736	4003	4270	4537	2	—
56								2870	3157	3444	3731	4018	4305	4592	4879	—	—
58								3079	3387	3694	4002	4310	4618	4926	5234	—	—
60								3295	3624	3954	4283	4612	4942	5271	5601	—	—
62								3518	3870	4222	4573	4925	5277	5629	5980	1	—
64								3749	4123	4498	4873	5248	5623	5998	6373	—	—
66								3986	4385	4784	5182	5581	5980	6378	6777	1	—
68								4232	4655	5078	5501	5924	6348	6771	7194	—	—
70								4484	4933	5381	5830	6278	6727	7175	7623	—	—

[1] Based on weighted regression: $V = 0.009152D^2H$. Standard error of estimate = 131.13 board feet or 12.43 percent of the mean volume.

[2] 20-inch class includes trees 19.1 to 21.0 inches in diameter.

[3] 80-foot class includes trees 75.1 to 85.0 inches in height.

[4] Number of trees; range of data for 160 redcedar and 32 Alaska-cedar enclosed by solid lines.

Table 13.—Board-foot volumes (1-foot stump to 40-percent top) given d.b.h. and number of logs to a 40-percent top, International 1/4-inch scale, for western redcedar and Alaska-cedar, southeastern Alaska[1]

D.b.h. (D)[2]	Merchantable height in 16-foot logs (H)[3]							Basis trees measured[4]	
	1	2	3	4	5	6	7	Red-cedar	Alaska-cedar
Inches								Number	
12	37	74	112	149				3	10
14	51	101	152	202	253			5	5
16	66	132	198	264	330			1	3
18	84	167	251	335	418	502		10	5
20	103	207	310	413	516	620		12	3
22		250	375	500	625	750		7	2
24		297	446	595	743	892		9	3
26		349	523	698	872	1047		9	--
28		405	607	810	1012	1214		6	1
30		465	697	929	1162	1394	1626	10	--
32		529	793	1057	1322	1586	1850	13	--
34		597	895	1194	1492	1790	2089	9	--
36		669	1004	1338	1673	2007	2342	14	--
38		745	1118	1491	1864	2236	2609	9	--
40		826	1239	1652	2065	2478	2891	6	--
42		911	1366	1821	2277	2732	3187	10	--
44		999	1499	1999	2499	2998	3498	5	--
46		1092	1639	2185	2731	3277	3823	5	--
48		1189	1784	2379	2974	3568	4163	6	--
50		1291	1936	2581	3227	3872	4517	--	--
52			2094	2792	3490	4188	4886	7	--
54			2258	3011	3764	4516	5269	2	--
56			2429	3238	4048	4857	5667	--	--
58			2605	3473	4342	5210	6079	--	--
60			2788	3717	4646	5576	6505	--	--
62			2977	3969	4961	5954	6946	1	--
64			3172	4229	5287	6344	7401	--	--
66			3373	4498	5622	6747	7871	1	--
68			3581	4774	5968	7162	8355	--	--
70			3795	5059	6324	7589	8854	--	--

[1] Based on weighted regression: $V = 0.258135D^2H$. Standard error of estimate = 106.42 board feet or 9.54 percent of the mean volume.

[2] 20-inch class includes trees 19.0 to 20.9 inches in diameter.

[3] Computed in 16.3-foot logs between a 1-foot stump and a top equaling 40 percent of d.b.h., but not less than 6.0 inches.

[4] Number of trees; range of data for 160 redcedar and 32 Alaska-cedar enclosed by solid lines.

Table 14.—Board-foot volumes (1-foot stump to a 40-percent top) given d.b.h. and number of logs to a 40-percent top, Scribner scale, for western redcedar and Alaska-cedar, southeast Alaska[1]

D.b.h. (D)[2]	Merchantable height in 16-foot logs (H)[3]							Basis: trees measured[4]	
	1	2	3	4	5	6	7	Red-cedar	Alaska-cedar
Inches								Number	
12	19	56	92	129				3	10
14	29	79	129	179	229			5	5
16	42	107	172	237	302			1	3
18	56	139	221	303	385	468		10	5
20	73	174	276	378	479	581		12	3
22	91	214	337	460	583	706		7	2
24	112	258	404	551	697	843		9	3
26		306	478	649	821	993		9	--
28		358	557	756	955	1155		6	1
30		414	642	871	1100	1329	1557	10	--
32		474	734	994	1254	1515	1775	13	--
34		538	832	1126	1419	1713	2007	9	--
36		606	936	1265	1594	1924	2253	14	--
38		679	1046	1412	1779	2146	2513	9	--
40		755	1162	1568	1975	2381	2788	6	--
42		835	1284	1732	2180	2628	3077	10	--
44		920	1412	1904	2396	2888	3380	5	--
46		1009	1546	2084	2621	3159	3697	5	--
48		1101	1687	2272	2857	3443	4028	6	--
50		1198	1833	2468	3104	3739	4374	--	--
52			1986	2673	3360	4047	4734	7	--
54			2144	2885	3626	4367	5108	2	--
56			2309	3106	3903	4700	5497	--	--
58			2480	3335	4190	5044	5899	--	--
60			2657	3572	4487	5401	6316	--	--
62			2840	3817	4794	5770	6747	1	--
64			3029	4070	5111	6152	7192	--	--
66			3225	4331	5438	6545	7652	1	--
68			3426	4601	5776	6951	8126	--	--
70			3634	4879	6124	7369	8614	--	--

[1] Based on weighted regression: $V = -1.4523D + 0.254093D^2H$. - Standard error of estimate = 101.45 board feet or 9.62 percent of the mean volume.

[2] 20-inch class includes trees 19.0 to 20.9 inches in diameter.

[3] Computed in 16.3-foot logs between a 1-foot stump and a top equaling 40 percent of d.b.h., but not less than 6.0 inches.

[4] Number of trees; range of data for 160 redcedar and 32 Alaska-cedar enclosed by solid lines.

GPO JACKET Number 795-253

The mission of the PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION is to provide the knowledge, technology, and alternatives for present and future protection, management, and use of forest, range, and related environments.

Within this overall mission, the Station conducts and stimulates research to facilitate and to accelerate progress toward the following goals:

1. Providing safe and efficient technology for inventory, protection, and use of resources.

2. Development and evaluation of alternative methods and levels of resource management.

3. Achievement of optimum sustained resource productivity consistent with maintaining a high quality forest environment.

The area of research encompasses Oregon, Washington, Alaska, and, in some cases, California, Hawaii, the Western States, and the Nation. Results of the research will be made available promptly. Project headquarters are at:

College, Alaska	Portland, Oregon
Juneau, Alaska	Roseburg, Oregon
Bend, Oregon	Olympia, Washington
Corvallis, Oregon	Seattle, Washington
La Grande, Oregon	Wenatchee, Washington